

[0011] High-performance polymers belong to the thermoplastic plastics, called "thermoplastics," for short, and are characterized by a very high maximum operational temperature according to UL 746 B (U.S. testing regulations of the Underwriters' Laboratories) and/or IEC 216, among other things, being in the range of about 160°C to about 260°C, i.e., which exhibits a very good heat resistance, a good to very good resistance to alkaline solutions, and increased stability values.

[0012] Due to these characteristics (mechanic, thermal, and chemical), mentioned as examples, high-performance polymers are quite optimally suitable for use as the material for lamellae. They have an improved expense/effectiveness ratio and are able to withstand worsened operating conditions for longer.

[0013] In order to increase the mechanical characteristics of the lamella and to reduce its sensitivity to the influence of mechanical forces, the high-performance polymer has a tensile strength  $R_m$  (DIN 53455) in the range of about 50 N/mm<sup>2</sup> to about 150 N/mm<sup>2</sup>, preferably about 70 N/mm<sup>2</sup> to about 110 N/mm<sup>2</sup>, and a breaking elongation  $A_s$  (DIN 53455) in the range of about 20 % to about 80 %, preferably about 30 % to about 60 %. Furthermore, the high-performance polymer has a modulus of elasticity module  $E$  (DIN 53457, ISO 527-2) in the range of about 500 N/mm<sup>2</sup> to about 10,000 N/mm<sup>2</sup>, preferably about 1,000 N/mm<sup>2</sup> to about 5,000 N/mm<sup>2</sup>.

[0014] The connection between the lamella and the turbulence generator may be constructed in a smaller fashion, if the high-performance polymer has an impact strength when notched (ISO 179) of about 40 kJ/m<sup>2</sup> to about 100 kJ/m<sup>2</sup>, preferably about 45 kJ/m<sup>2</sup> to about 90 kJ/m<sup>2</sup>.

[0015] The behavior of the lamella concerning moisture and water (hydrolysis resistance) is decisively improved if the high-performance polymer has a moisture acceptance  $FA$  (ISO 62) in the range of about 0.05 % to about 2 %, preferably about 0.2 % to about 1.2 %.

**[0016]** In order to allow an efficient and inexpensive cleaning of a lamella, the high-performance polymer has a heat resistance WB (DIN 53461) in the range of about 120°C to about 230°C, preferably about 170°C to about 220°C, and a good to very good resistance to alkaline solutions. With these values, the performance of cleaning the headbox by "boil out" is possible, i.e., the presence of temperatures in the range of about 100°C and, simultaneously, the use of sodium hydroxide (NaOH) of about 20%.

**[0017]** In order to ensure the dimensional stability even during operation, the high-performance polymer has a low swelling Q, in particular, a low linear swelling  $Q_L$ , in the preferred range of about 0.02 % to about 0.2 %.

**[0018]** Out of the group of high-performance polymers that perform the above-mentioned requirements during operation and during cleaning of the headbox in an excellent fashion, polyphenylene sulphone (PPSU), polyether sulphone (PES), polyetherimide (PEI), and polysulphone (PSU) are recommended. The first three mentioned high-performance polymers were not developed until most recently.

**[0019]** Depending on the use in question, the lamella reaching to the region of the nozzle may, on its structure less end region viewed in the flow direction, have a dull lamella end having a height less than about 0.4 mm, preferably less than about 0.3 mm, or have on its structured end region viewed in the flow direction, a dull lamella end having a height of more than about 0.5 mm. In another embodiment, a structured end region can be provided with a grooved structure having a rectangular and/or wedge-like and/or parabolic and/or round shape with a constant and/or varying depth.

**[0020]** In an advantageous embodiment, the lamella is completely constructed of one high-performance polymer in a homogenous design; in an alternative embodiment, the lamella end only is formed from at least one high-performance

polymer. Thus, both embodiments ensure that at least the critical region of the lamella, i.e., the lamella end in the preferred embodiment of a lamella tip, has the advantageous characteristics of the high-performance polymer.

[0021] Furthermore, the lamella according to the invention may be embodied in a headbox with sectioned stock density control (dilution water technology). In this embodiment of the headbox, the possibility is created of allowing the sectional control of throughput, stock density, and, thus, basis weight and orientation of the fibers in the presence of the optimized lamellae.

[0022] In order to take into account present and future requirements of production with regard to the production amount, the headbox may be designed for a flow speed greater than about 1,500 m/s, preferably greater than about 1,800 m/s.

[0023] The lamella may also be integrated in a headbox embodied as a multi-layered headbox with the lamella essentially having the above-mentioned characteristics, embodied as a separating lamella of a multi-layered headbox.

[0024] It must be understood that the characteristics of the invention mentioned above and to be explained below can be used not only in the combinations mentioned, but also in different combinations or alone without departing from the scope of the invention.

[0025] The present invention is directed a lamella positionable in a headbox of a web production machine. The lamella is formed of at least one high-performance polymer; and the at least one high-performance polymer may include high stability, high heat resistance, and good to very good resistance to at least one of alkaline solution and acid.

[0026] In accordance with a feature of the present invention, the web production machine can include one of a paper, cardboard and tissue machine.

[0027] The high-performance polymer may have a tensile strength  $R_m$  (DIN